

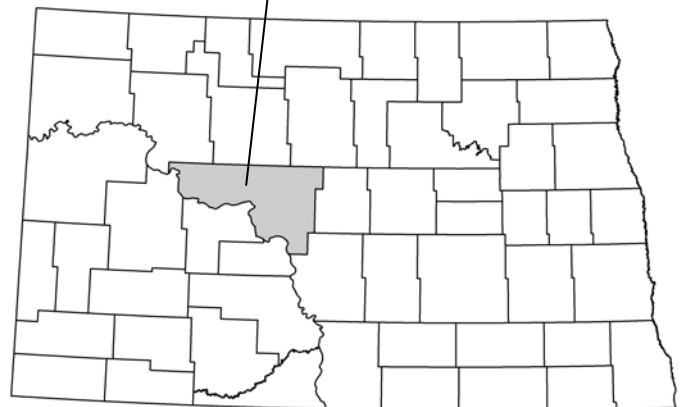
FLOOD INSURANCE STUDY



MCLEAN COUNTY, NORTH DAKOTA AND INCORPORATED AREAS

Community Name	Community Number
*BENEDICT, CITY OF	380367
*BUTTE, CITY OF	380356
*COLEHARBOR, CITY OF	380058
GARRISON, CITY OF	380059
*MAX, CITY OF	380680
MCLEAN COUNTY	380057
(UNINCORPORATED AREAS)	
*MERCER, CITY OF	380357
*RIVERDALE, CITY OF	380358
*RUSO, CITY OF	380336
THREE AFFILIATED TRIBES	
OF FORT BERTHOLD RESERVATION	380721
*TURTLE LAKE, CITY OF	380061
*UNDERWOOD, CITY OF	380062
WASHBURN, CITY OF	380063
*WILTON, CITY OF	380065

McLean County



*Non-Floodprone Areas

Effective: August 19, 2010



Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER

38055CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Selected Flood Insurance Rate Map panels for the community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard designations have been changed as follows:

<u>Old Zone</u>	<u>New Zone</u>
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

Initial County-wide FIS Effective Date: August 19, 2010

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY
MCLEAN COUNTY, NORTH DAKOTA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of McLean County, North Dakota, including the Cities of Benedict, Butte, Coleharbor, Garrison, Max, Mercer, Riverdale, Ruso, Turtle Lake, Underwood, Washburn and Wilton, as well as the Three Affiliated Tribes of Fort Berthold Reservation and the unincorporated areas of McLean County (referred to collectively herein as McLean County) and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood hazard data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by McLean County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

No special flood hazard areas were identified in the Cities of Benedict, Butte, Coleharbor, Max, Mercer, Riverdale, Ruso, Turtle Lake, Underwood or Wilton.

1.2 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

Flood Hazard Boundary Maps were previously issued for the Cities of Washburn, Underwood, Turtle Lake, and Garrison, but were subsequently rescinded. No other special flood hazard areas were identified in McLean County prior to this current study effort (References 4,5,6,7).

The current Approximate Flood Hazard areas surrounding Lake Sakakawea and Lake Audubon were defined by Houston Engineering, Inc. for the North Dakota State Water Commission (NDSWC) and the Federal Emergency Management Agency (FEMA) under Contract EMD-2008-GR-0877, CTP. The study was completed in April, 2009. The hydrology for the approximate study along the Missouri River was taken from a U.S. Army Corps of Engineers Hydrologic Statistics Technical Report – RCC Technical Report F-99.

Base map information shown on the county-wide DFIRM was derived from 2005 aerial photography obtained from the United States Department of Agricultural – Farm Service Agency. The aerial photography has a pixel resolution of 1 meter. Hydrology information for the county-wide DFIRM was obtained from the United States Geologic Survey (USGS) Hydrography Data Set.

1.3 Coordination

The initial Consultation Coordination Officer (CCO) meeting for the county-wide DFIRM project was held on March 19, 2008 at the McLean County Courthouse in Washburn, ND. The meeting was attended by representatives of FEMA Region 8, Michael Baker Jr., Inc., the NDSWC, Houston Engineering, Inc. (HEI), McLean County, and the Cities of Underwood and Washburn. Communities not in attendance were contacted by telephone to discuss their study needs. The purpose of the meeting was to explain the nature and purpose of the countywide DFIRM project and to identify the streams to be studied by detailed and/or approximate methods.

The results of this study were reviewed at the final CCO meeting held on November 18, 2009 and attended by representatives of McLean County, the City of Washburn, FEMA, the NDSWC and HEI. All issues raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of McLean County, North Dakota, including the incorporated communities listed in Section 1.1. No flooding sources have been studied by detailed methods in McLean County, in either prior studies or as part of this current study.

New approximate floodplain boundaries were defined along the shoreline of Lakes Audubon and Sakakawea as well as along the Missouri River below Garrison Dam.

2.2 Community Description

McLean County is located in west-central North Dakota. It is bordered by Ward and Mountrail Counties to the north, Dunn County to the west, Mercer and Oliver Counties to the south, and Sheridan and Burleigh Counties to the east. The Missouri River and Lake Sakakawea form the boundary with Mercer and Oliver Counties, thus a large portion of Lake Sakakawea is located within the county along with all of Lake Audubon. The population of McLean County was 9,311 according to the 2000 census. The City of Washburn is the county seat with a population of 1,389 (Reference 2).

McLean County is located on the east side of the Williston Basin. The eastern part of the county is part of the Missouri Coteau and is characterized by hilly terrain. Most of the remainder of the county is part of the Coteau Slope, characterized by a gently rolling surface. The Missouri Trench is located in the western part of the county, and is characterized by steep slopes developed mainly on bedrock. Most of the county drains to Lake Sakakawea and the Missouri River (Reference 3).

The climate is typically dry with the mean annual precipitation varying from 15 inches in the west to 17 inches in the east. Temperatures are highly variable with summer highs in excess of 90 degrees and winter lows below zero both common (Reference 1).

2.3 Principal Flood Problems

The fact that there have been no effective maps for any communities in McLean County for many years reflects the historically minor nature of flooding problems. However, as development continues along the shores of Lake Sakakawea, Lake Audubon, and the Missouri River, future problems can be anticipated without some identification of the hazard.

During the scoping meeting localized problems resulting from heavy precipitation events were noted to have occurred in some communities. These localized problems generally resulted from the lack of an adequate outlet for sheetwater accumulations and were not associated with defined lake or riverine systems.

Some flooding has been experienced in the City of Max, but measures have since been implemented to provide an outlet for local wetlands in order to alleviate the flood hazard.

2.4 Flood Protection Measures

Construction of Garrison Dam on the Missouri River was completed in 1953. The structure provides a multi-purpose benefit including power generation and flood control. The regulation of flows has provided an extensive flood control benefit for downstream communities and agricultural producers. The City of Washburn is located along the Missouri River downstream of Garrison Dam.

Other than the efforts to provide an outlet for wetland areas in the City of Max, no other flood protection measures have been constructed in McLean County.

3.0 ENGINEERING METHODS

No flooding sources were studied by detailed methods in McLean County. Instead the areas subject to flooding during a 1-percent chance event have been identified using approximate methodologies. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

No flooding sources were studied by detailed methods. Discharges for the Missouri River approximate study were taken from a U.S. Army Corps of Engineers Hydrologic Statistics Technical Report – RCC Technical Report F-99 (Reference 9), which established a 1% annual chance exceedance discharge of 76,000 cfs for the Missouri River below Garrison Dam.

3.2 Hydraulic Analyses

No flooding sources were studied by detailed methods. For the approximate study along the Missouri River, the hydraulics were simulated using HEC-RAS version 4.0 (Reference 8). Model geometry was developed from the USGS 10 meter DEM. HEC-geoRAS was used to generate the model geometry from the DEM. The model reach is 45 miles long and contains no hydraulic structures. The upstream limit is Garrison Dam, and the downstream limit is the McLean/Burleigh County line. The roughness coefficients were determined from prior hydraulic studies completed by the US Army Corps of Engineers and Houston Engineering, Inc. A Manning's 'n' of 0.025 was used for the channel, 0.05 for agricultural areas, 0.12 for heavily forested and developed areas, and 0.06 was used for areas containing light trees and brush. The downstream boundary condition was established using normal depth and a slope of 0.00016.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using NAVD88 as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the NGVD 29 and NAVD 88, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov>, or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support

Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineation of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data Table and Summary of Stillwater Elevations Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. No stream reaches have been studied by detailed methods as part of this FIS. For the approximate study for Lake Sakakawea, prior work was completed as part of the Mercer County DFIRM project (Reference 10) to identify an appropriate elevation for mapping the flood hazard around Lake Sakakawea in Mercer County within the Three Affiliated Tribes of Fort Berthold Reservation. The existing mapped approximate boundary in Mercer County, outside the reservation boundary, was compared with the available 10 meter DEM, and the elevation was found to vary between 1849.2 and 1869.1 (NAVD 88). Recognizing that the maximum operating pool for Lake Sakakawea is 1855.3 (NAVD 88), an elevation of 1860 (NAVD 88) was used to map the approximate floodplain in Mercer County, allowing 4.7 feet for wave run-up. This same elevation was correspondingly used to map the approximate floodplain around Lake Sakakawea in McLean County using the USGS 10 meter DEM.

A similar process was used to define an elevation for mapping the flood hazard around Lake Audubon. The summer operating level is 1848.3 (NAVD 88). A wave run-up of 4.7 feet above the target operating level was assumed, similar to what was used for Lake Sakakawea, resulting in a flood hazard elevation of 1853.0 (NAVD 88). The USGS 10 meter DEM was used to map the approximate floodplain around Lake Audubon.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent annual chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to one (1) foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

Because no flooding sources in McLean County were studied by detailed methods, no floodways have been identified.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent annual chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of McLean County. Previously, separate Flood Hazard Boundary Maps and/or FIRMs were prepared for each identified flood-prone incorporated community and the unincorporated areas of the county. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community, up to and including this countywide FIS, are presented in Table 1, "Community Map History."

COMMUNITY NAME		INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
*Benedict, City of *Butte, City of *Coleharbor, City of Garrison, City of *Max, City of McLean County (Unincorporated Areas) *Mercer, City of *Riverdale, City of *Ruso, City of Three Affiliated Tribes of Fort Berthold Reservation *Turtle Lake, City of *Underwood, City of Washburn, City of *Wilton, City of		N/A	N/A	N/A	
		N/A	N/A	N/A	
		N/A	N/A	N/A	
		August 19, 2010	N/A	August 19, 2010	
		N/A	N/A	N/A	
		June 4, 1987	N/A	June 4, 1987	
		N/A	N/A	N/A	
		N/A	NA	N/A	
		N/A	N/A	N/A	
		August 19, 2010	N/A	August 19, 2010	
		N/A	N/A	N/A	
		N/A	N/A	N/A	
		August 19, 2010	N/A	August 19, 2010	
		N/A	N/A	N/A	
*Non-Floodprone Area					
TABLE 1	FEDERAL EMERGENCY MANAGEMENT AGENCY MCLEAN COUNTY, ND AND INCORPORATED AREAS		COMMUNITY MAP HISTORY		

7.0 OTHER STUDIES

This FIS was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by other organizations originally for purposes other than the NFIP. The data were identified as the best available at the time of compilation of this FIS and should depict the general conditions of the flooding sources with relative accuracy.

Information pertaining to revised and unrevised flood hazards for each jurisdiction within McLean County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS Reports, FHBMs, FBFMs, and FIRMs for all of the incorporated and unincorporated jurisdictions within McLean County.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this FIS can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267.

9.0 BIBLIOGRAPHY AND REFERENCES

1. USDA, Natural Resources Conservation Service (formerly Soil Conservation Service), Hydrology Manual for North Dakota (revised 1980).
2. U.S. Department of Commerce, Bureau of the Census, 2000 Census of Population and Housing, North Dakota.
3. North Dakota Geological Survey, Bulletin 60, Geology of McLean County, North Dakota, 1971.
4. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Washburn, January 16, 1976.
5. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Underwood, October 15, 1976.
6. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Turtle Lake, December 19, 1975.
7. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Garrison, December 26, 1975.
8. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-River Analysis System (HEC-RAS), version 4.0.
9. U.S. Army Corps of Engineers, Missouri River Region Reservoir Control Center, Missouri River Main Stem Reservoirs Hydrologic Statistics, RCC Technical Report F-99, February, 1999.
10. Federal Emergency Management Agency, Flood Insurance Study Mercer County, North Dakota and Incorporated Areas, Draft, 2008.